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OUTBOARD MARINE CORPORATION
WAUKEGAN HARBOR BORINGS
WAUKEGAN, ILLINOIS

C 9291

WARZYN
ENGINEERING INC

Consulting Engineers • Civil • Structural • Geotechnical • Materials Testing • Soil Borings • Surveying

1409 EMIL STREET, P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

August 5, 1980
C 9291

Mason & Hangar-Silas Mason Company, Inc.
P.O. Box 1316
Edison, New Jersey 08817

Attention: Harry Sterling, PhD.

Re: Waukegan Harbor Borings
Outboard Marine Corporation
Waukegan, IL

Gentlemen:

We are pleased to submit three (3) copies of our report and associated drawings describing the subsurface investigation performed in Waukegan Harbor and at the Outboard Marine Corporation Facility in Waukegan, Illinois. Thank you for contacting us with regard to this investigation. If you should have any questions or desire further clarification, please feel free to contact us.

Very truly yours,

WARZYN ENGINEERING INC.

Robert J. Karnauskas /pag

Robert J. Karnauskas
Hydrogeologist/Project Manager

RJK/pag

Enclosures: As Stated

WARZYN ENGINEERING INC

OUTBOARD MARINE CORPORATION
WAUKEGAN HARBOR BORINGS
WAUKEGAN, ILLINOIS

Job No. C 9291

Date August 5, 1980

INTRODUCTION

This report describes soil sampling work performed on July 1 and 2, 1980, at Waukegan Harbor, to collect bottom sediments, underlying cohesive soils and harbor water for chemical analysis and determination of engineering properties. Waukegan Harbor is located in Section 22, T45N, R12E, Lake County, Illinois.

Chain of Custody procedures were observed during drilling operations as dictated by Mason and Hanger-Silas Mason Company, Inc. (hereafter referred to as Mason and Hanger.) Infield conditions necessitated significant changes in the original scope of work. All changes were approved by Mason and Hanger personnel present during drilling operations.

Access problems to Outboard Marine Corporation (OMC) property developed during operations resulting in our inability to perform borings along the north ditch as outlined in original scope of work. These access difficulties also prevented Warzyn Engineering survey personnel from entering Outboard Marine Corporation property to tie in locations of borings performed in Waukegan Harbor into existing benchmarks and grid coordinates established during the previous study. Survey data compiled to date is included herein to allow more precise establishment of harbor boring locations at a future date, if necessary.

CHAIN OF CUSTODY PROCEDURES

Chain of custody procedures, were employed with regard to handling of a number of samples obtained during this investigation. The following discussion describes the samples handled by chain of custody sampling procedures.

On July 1, 1980, boring locations 4, 5, and 6 were completed. At each boring location a 5 gallon sediment sample was taken which required chain of custody procedures. After collection, samples were affixed with an Environmental Protection Agency (EPA) approved seal and kept under direct observation or locked in a safe and secure place. At the end of the day the samples were signed from the field sampler, Clark Gregory Kimball of Warzyn Engineering, to Harry Sterling, Jr. of Mason and Hanger; dated July 1, 1980. Custody of subsamples of the 5 gallon sediment samples prepared by Mason and Hanger was assumed by Clark Gregory Kimball on July 3, 1980 for delivery to the laboratory.

July 2, 1980, boring locations 1, 2, and 3 were completed. At each location the following samples were obtained: 1) a 5 gallon sediment, sample, 2) two, splitspoon, cohesive soil jar samples, and 3) two mixed-sediment, jar samples were obtained which required chain of custody procedures. The two splitspoon and mixed sediment jar samples were placed in a box which was kept in sight or locked in a secure location at all times. The 5 gallon sediment sample was affixed with an EPA seal and also kept in sight or secured at all times. At the end of the day the 5 gallon sediment samples were signed over to Harry Sterling, Jr. of Mason and Hanger. The box of splitspoon and mixed sediment jar samples was sealed and retained by Clark Gregory Kimball of Warzyn Engineering.

The jar samples (Boring locations 1 through 6) were kept locked or in sight until being returned to Madison, Wisconsin where the samples were signed over to Vincent Deneen of Raltech Scientific Services of Madison, Wisconsin, for chemical analysis per Mason and Hanger's request.

SAMPLE COLLECTION AND FIELD PROCEDURES

Sampling operations were accomplished utilizing a dredging barge (approximately 140 ft. x 80 ft.) powered by a tugboat. Prior to mobilization at Waukegan Harbor, the drill rig (CME-550) and related equipment were steam cleaned to remove oil, grease and mud. Drilling operations were performed off the side of the barge.

Present during sampling operations was a crew for the barge and tugboat of Falcon Marine, Warzyn Engineering drillers and field geologist, a representative from Mason and Hanger, and for the first day only a representative from the Environmental Protection Agency.

On July 1, 1980, boring locations performed, in order, were Nos. 5, 4, and 6. Refer to Drawing C 9291-1 for locations. At these locations, samples collected included a 5 gallon mixed bottom sediment sample and a 10 gallon water sample at boring location No. 4 sample containers were provided by Mason and Hanger.

The barge was manuevered into position, and large metal I beams were lowered from the barge as spud bars to hold the barge in the proper position. A sounding of water depth was done and then a 2 inch diameter splitspoon sample was taken, 1) to sample the upper sediments and 2) to record blow counts on these upper sediments. It was determined that the upper sediments were very soft such that the split spoon settled through these upper sediments without the drive weight being used. Therefore

the blow counts recorded were of lower sediments and/or underlying cohesive soils. Split spoon samples were retained by Warzyn Engineering for analysis of sediment properties.

Several attempts were made to recover upper sediment samples utilizing 4 inch diameter casing and 3 inch diameter Shelby Tubes without success. It was expected that casing advanced into underlying cohesive soils would form a plug in the casing and retain sediments within the casing. It became apparent that sampling with casing was ineffective and that Shelby Tube samples (when a sample was retained) were not representative of upper sediments which were too soft to be retained within the Shelby Tube. Therefore a clam shell type sediment sampler designed for bottom sampling was used in conjunction with Shelby tubes. The clam-shell sediment sampler worked like a small dredging bucket and could bring the soft, upper sediments to the surface for sampling purposes while the Shelby tubes could retain lower, more dense sediments which the clam-shell sampler was unable to reach.

The clam-shell sampler and the Shelby tubes were emptied into a previously cleaned galvanized steel wash tub, mixed, and transferred to 5 gallon jugs supplied by Mason and Hanger. These 5 gallon jugs were then secured for chain of custody as previously described.

Equipment used during sampling was hosed down with harbor water pumped through the high pressure pumps on the drill rig to remove soil residues. This procedure was repeated for boring locations No. 4 and 6 with the addition of a 10 gallon water sample obtained at boring location No. 4. The 10 gallon water sample was a grab sample obtained by lowering the 10 gallon jug over the side of the barge. Logs of the borings were kept throughout the sampling operation. Refer to Appendix C for boring logs.

On July 2, boring loctions 1, 2, and 3 (in this order) were completed. The barge was manuevered into position and spud bars were lowered so as to hold the barge in that position, followed by depth of water sounding. Equipment was cleaned with acetone to minimize possible PCB contamination from the equipment, prior to sampling. The acetone cleaned equipment was placed on plastic sheeting to prevent contamination from the barge surface.

The first splitspoon sampling was performed the same as at previous boring locations and the samples were retained by Warzyn Engineering for physical analysis. If the splitspoon sample did not show cohesive soils, it was again lowered into the sediments until the blow count indicated the presence of cohesive soils. When the depth of cohesive soils was determined, a 4 inch diameter casing was advanced into the cohesive soils approximately four inches to one foot. The casing was then washed out using standard wash boring techniques to the top of the cohesive soil surface. A split spoon core barrel cleaned with acetone, was lowered down the casing and samples obtained.

The split spoon sample was subdivided as follows: the top 6 inches was bottled in a 32 oz. glass jar with an aluminum foil lined lid and labeled sample "1A" for Mason and Hanger; the bottom 6 inches of the cohesive soil sample was bottled in the same manner and labeled "2A" for Mason and Hanger; the remaining cohesive soil sample was retained by Warzyn Engineering for analysis of engineering properties. Mason and Hanger jar samples were treated with chain of custody procedures. The bore hole was backfilled with bentonite pellets before casing was removed.

Shelby tube samples were taken to obtain lower sediment samples, (although Shelby tubes did not always retain a sample, an attempt was usually made), and the clam shell sampler was used to obtain a sample of upper sediments. The Shelby tubes and the clam-shell samples were emptied into a previously cleaned galvanized steel tub, mixed, and from the mixture two 32 ounce jar samples labeled "3A" and "4A" were obtained for Mason and Hanger. The remaining sediment sample was put into a 5 gallon plastic jug. Chain of custody procedures were observed for the jar and jug samples. A 10 gallon water sample was also collected by the grab sample manner. These procedures were repeated at boring locations No. 2 and 3 with the exception that boring location No. 2 had no water sample taken.

As stated earlier in the text, boring locations were surveyed, though not tied into existing benchmarks on Outboard Marine Corporation property. Appendix E consists of survey data observed before the survey crew was prohibited from entering Outboard Marine Corporation property. Surveying of Boring Location Nos. 4, 5, and 6 was accomplished with electronic distance measuring equipment and transit from traverse points established on shore to the barge in position at the boring location. Surveying of Boring Location Nos. 1, 2, and 3 was accomplished by establishing traverse points visible on either side of the channel between which the barge could be aligned. Once positioned, the distance to one of the traverse points was measured with a fiberglass tape.

The 2 gallon cohesive soil sample, (referred to in the original scope of work), was attempted with a core barrel sampler and Shelby tubes at Boring Location No. 1 without success, was aborted. Later Shelby tubes at Boring Location No. 2 brought up three samples of cohesive soil during the sampling for lower sediments, which were bottled and retained by Mason and Hanger as a substitute for the 2 gallon cohesive soil sample.

A summary of soil and waster samples obtained is as follows:

on	Samples(s) Obtained	Person/Representing, Assuming Custody
	1-5 gal. Mixed Bottom Sediment Sample	Harry Sterling, Jr./ Mason & Hanger-Silas Mason Co. Inc.
	2-32 oz. Cohesive Soil Sample	Vincent Deneen/ Raltech Scientific Services
	2-32 oz. Bottom Sediment Sample	Vincent Deneen/ Raltech Scientific Services
	1-10 gal. Harbor Water Sample	Not Applicable
	1-5 gal. Mixed Bottom Sediment Sample	Harry Sterling, Jr./ Mason & Hanger-Silas Mason Co. Inc.
	2-32 oz. Cohesive Soil Sample	Vincent Deneen/ Raltech Scientific Services
	2-32 oz. Bottom Sediment Sample	Vincent Deneen/ Raltech Scientific Services
	3-32 oz. Cohesive Soil Samples (Shelby Tube)	Not Applicable
	1-5 gal. Mixed Bottom Sediment Sample	Harry Sterling, Jr./ Mason & Hanger-Silas Mason Co. Inc.
	2-32 oz. Cohesive Soil Sample	Vincent Deneen/ Raltech Scientific Services
	2-32 oz. Bottom Sediment Sample	Vincent Deneen/ Raltech Scientific Services
	1-10 gal. Harbor Water Sample	Not Applicable

Location	Samples(s) Obtained	Receiving Chain of Custody
#4	1-5 gal. Mixed Bottom Sediment Sample	Harry Sterling, Jr./ Mason & Hanger-Silar Mason Co. Inc.
	2-32 oz. Bottom Sediment Sample*	Vincent Deneen/ Raltech Scientific Services
	1-10 gal. Harbor Water Sample	Not Applicable
#5	1-5 gal. Mixed Bottom Sediment Sample	Harry Sterling, Jr./ Mason & Hanger-Silas Mason Co. Inc.
	2-32 oz. Bottom Sediment Sample*	Vincent Deneen/ Raltech Scientific Services
#6	1-5 gal. Mixed Bottom Sediment Sample	Harry Sterling, Jr./ Mason & Hanger-Silar Mason Co. Inc.
	2-32 oz. Bottom Sediment Sample*	Vincent Deneen/ Raltech Scientific Services

* Subsamples of 5 gallon Mixed Bottom Sediment Sample prepared by Mason & Hanger.

SEDIMENT AND SOIL PROPERTIES

Six borings were performed penetrating 15 feet to 23 feet of water and 15 feet to 3 1/2 feet of harbor sediments. Boring locations are shown on Drawing C 9291-1. Soil samples retained by Warzyn Engineering were analyzed for grain size, hydrometer, Atterberg limits, percent moisture, and loss on ignition. These data are contained in Appendix D. General sediment stratigraphy, in decending order is as follows:

Soil Description Unified Soil Classification) System (USCS)	Typical Grain Size Distribution (Gravel/Sand/Silt/Clay or) (Gravel/Sand/Silt & Clay)
Very soft, black, organic clayey silt, trace to some sand (OL)	1/38/48/13
Medium dense to loose, fine to medium sand, some to trace silt, little to trace clay, gravel and organics (SM)	5/81/14
Very stiff to hard, gray silt, some clay to silty clay trace to some fine sand, trace gravel (ML,CL)	2/17/56/25

* Splitspoon driven with 140 lb. weight dropped 30 inches.

The uppermost sediment (black, organic silt-OL) is extremely soft and may almost be considered to be in suspension (moisture content of 90%). It is highly organic with loss on ignition of 22.5% which ranks it in the range of a sedimentary peat. It is thickest at the north end of the harbor in the main channel and just within Slip No. 3 with thicknesses of 3 feet to 4 1/2 feet. Reference Drawing C 9291-1 for location. Thicknesses decrease to the south, to the minimum encountered thickness of 1 foot at boring location No. 6.

Beneath the uppermost sediment is a sandy soil (SM) of medium to low density with occasional thin gravel layers and varying proportions of silt and clay. It is also thickest in the north end of the harbor just within Slip No. 3 and in the main channel. It is absent just south of the main channel, but reappears as a 6 inch layer at boring location No. 6.

Underlying the sandy soil is a hard (blow counts up to 72 per 6 inches), gray, clayey silt (ML) to silty clay (CL). This soil was penetrated at all locations and was sampled at location Nos. 1, 2, and 3 with the greatest penetration (8 1/2 feet) occurring at boring location No. 1 where a core barrel sampler was used.

CLOSING REMARKS

We trust this report and the information contained herein meets your present needs. If you have any questions or desire further information, please feel free to contact us.

Respectfully submitted,

WARZYN ENGINEERING INC.

Clark Gregory Kimball/pag

Clark Gregory Kimball
Project Geologist

Robert J. Karnauskas/pag

Robert J. Karnauskas, Hydrogeologist
Project Manager

Daniel R. Viste

Daniel R. Viste, CPGS
Senior Advisor/Associate

CGK/RJK/DRV/pag

APPENDIX "A"

Subsurface Investigation

GENERAL REMARKS

We have endeavored to evaluate subsurface conditions and physical properties of the subsoil as revealed by the borings and laboratory testing. A problem inherent in this evaluation is the variability in engineering properties within soil strata involved, and specifically in any location variation in the soil which is located between borings. Due to natural or man-made causes, subsurface conditions may change with time.

Conclusions drawn and recommendations given in this report are for a specific proposed use of this site. They are our opinions and are based upon conditions that existed at the boring locations and such parameters as proposed site usage, soil loading, elevations, etc..

Since subsurface conditions depend on seasonal moisture variations, frost action, construction methods, and the inherent natural variations, careful observations must be made during construction. These should be brought to our attention as it may be necessary to modify the conclusions and recommendations presented herein.

FIELD METHODS
for
EXPLORATION AND SAMPLING SOILS

A. Boring Procedures Between Samples

The bore hole is extended downward, between samples, by a continuous flight auger, driven and washed-out casing, or rotary boring with drilling mud or water.

B. Standard Penetration Test and Split-Barrel Sampling of Soils (ASTM* Designation: D 1586)

This method consists of driving a 2" outside diameter split barrel sampler using a 140 pound weight falling freely through a distance of 30 inches. The sampler is first seated 6" into the material to be sampled and then driven 12". The number of blows required to drive the sampler the final 12" is recorded on the log of borings and known as the Standard Penetration Resistance. Recovered samples are first classified as to texture by the driller. Later, in the laboratory the driller's classification is reviewed by a soils engineer who examines each sample.

C. Thin-walled Tube Sampling of Soils (ASTM* Designation: D 1587)

This method consists of forcing a 2" or 3" outside diameter thin wall tube by hydraulic or other means into soils, usually cohesive types. Relatively undisturbed samples are recovered.

D. Soil Investigation and Sampling by Auger Borings (ASTM* Designation: D 1452)

This method consists of augering a hole and removing representative soil samples from the auger flight or bucket at 5'0" intervals or with each change in the substrata. Relatively disturbed samples are obtained and its use is therefore limited to situations where it is satisfactory to determine approximate subsurface profile.

E. Diamond Core Drilling for Site Investigation (ASTM* Designation: D 2113)

This method consists of advancing a hole in hard strata by rotating downward a single tube or double tube core barrel equipped with a cutting bit. Diamond, tungsten carbide, or other cutting agents may be used for the bit. Wash water is used to remove the cuttings. Normally a 2" O.D. by 1 3/8" I.D. coring bit is used unless otherwise noted. The rock or hard material recovered within the core barrel is examined in the field and laboratory. Cores are stored in partitioned boxes and the length of recovered material is expressed as a percentage of the actual distance penetrated.

*American Society for Testing and Materials, Philadelphia, Pennsylvania

APPENDIX C

BORING LOGS

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LOG OF TEST BORING

General Notes

Descriptive Soil Classification

GRAIN SIZE TERMINOLOGY

Soil Fraction	Particle Size	U.S. Standard Sieve Size
Boulders	Larger than 12"	Larger than 12"
Cobbles	3" to 12"	3" to 12"
Gravel: Coarse	¾" to 3"	¾" to 3"
Fine	4.76 mm to ¾"	#4 to ¾"
Sand: Coarse	2.00 mm to 4.76 mm	#10 to #4
Medium	0.42 mm to 2.00 mm	#40 to #10
Fine	0.074 mm to 0.42 mm	#200 to #40
Silt	0.005 mm to 0.074 mm	Smaller than #200
Clay	Smaller than 0.005 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

GENERAL TERMINOLOGY

Physical Characteristics
Color, moisture, grain shape, fineness, etc.

Major Constituents
Clay, silt, sand, gravel

Structure
Laminated, varved, fibrous, stratified, cemented, fissured, etc.

Geologic Origin
Glacial, alluvial, eolian, residual, etc.

RELATIVE DENSITY

Term	"N" Value
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

RELATIVE PROPORTIONS OF COHESIONLESS SOILS

Proportion	Defining Range By Percentage of Weight
Trace	0%- 5%
Little	5%-12%
Some	12%-35%
And	35%-50%

CONSISTENCY

Term	q_u-tons/sq. ft.
Very Soft	0.0 to 0.25
Soft	0.25 to 0.50
Medium	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	Over 4.0

ORGANIC CONTENT BY COMBUSTION METHOD

Soil Description	Loss on Ignition
Organic	Less than 4%
Organic Silt/Clay	4-12%
Fibrous Peat	12-50%
Fibrous and Woody Peat	More than 50%

PLASTICITY

Term	Plastic Index
None to Slight	0-4
Slight	5-7
Medium	8-22
High to Very High	Over 22

Standard penetration resistance, N, is the summation of the number of blows required to effect two successive 6" penetrations of the 2" split-barrel sampler. The sampler is driven with a 140 lb. weight falling 30" and is seated to a depth of 8" before commencing the standard penetration test.

Symbols

DRILLING AND SAMPLING

CS—Continuous Sampling
RC—Rock Coring: Size AW, BW, NW, 2" W
RQD—Rock Quality Designator
RB—Rock Bit
FT—Fish Tail
DC—Drove Casing
C—Casing: Size 2½", NW, 4", HW
CW—Clear Water
DM—Drilling Mud
HSA—Hollow Stem Auger
FA—Flight Auger
HA—Hand Auger
COA—Clean-Out Auger
SS—2" Diameter Split-Barrel Sample
2ST—2" Diameter Thin-Walled Tube Sample
3ST—3" Diameter Thin-Walled Tube Sample
PT—3" Diameter Piston Tube Sample
AS—Auger Sample
WS—Wash Sample
PTS—Peat Sample
PS—Pitcher Sample
NR—No Recovery
S—Sounding
PMT—Borehole Pressuremeter Test
VS—Vane Shear Test
WPT—Water Pressure Test

LABORATORY TESTS

q_p—Penetrometer Reading, tons/sq. ft.
q_u—Unconfined Strength, tons/sq. ft.
W—Moisture Content, %
LL—Liquid Limit, %
PL—Plastic Limit, %
SL—Shrinkage Limit, %
LI—Loss on Ignition, %
D—Dry Unit Weight, lbs./cu. ft.
pH—Measure of Soil Alkalinity or Acidity
FS—Free Swell, %

WATER LEVEL MEASUREMENT

▽—Water Level at time shown
NW—No Water Encountered
WD—While Drilling
BCR—Before Casing Removal
ACR—After Casing Removal
CW—Caved and Wet
CM—Caved and Moist

Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive soils.

UNIFIED SOIL CLASSIFICATION SYSTEM

COARSE-GRAINED SOILS

More than half of material is larger than No. 200 seive size.)

Clean Gravels (Little or no fines)

GW	Well-graded gravels, gravel-sand mixtures, little or no fines
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines

Gravels with Fines (Appreciable amount of fines)

GM^{d}_{u}	Silty gravels, gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures

Clean Sands (Little or no fines)

SW	Well-graded sands, gravelly sands, little or no fines
SP	Poorly graded sands, gravelly sands, little or no fines

Sands with Fines (Appreciable amount of fines)

SM^{d}_{u}	Silty sands, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures

FINE-GRAINED SOILS

ore than half of material is smaller than No. 200 sieve.)

ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
OL	Organic silts and organic silty clays of low plasticity
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
CH	Inorganic clays of high plasticity, fat clays
OH	Organic clays of medium to high plasticity, organic silts
PT	Peat and other highly organic soils

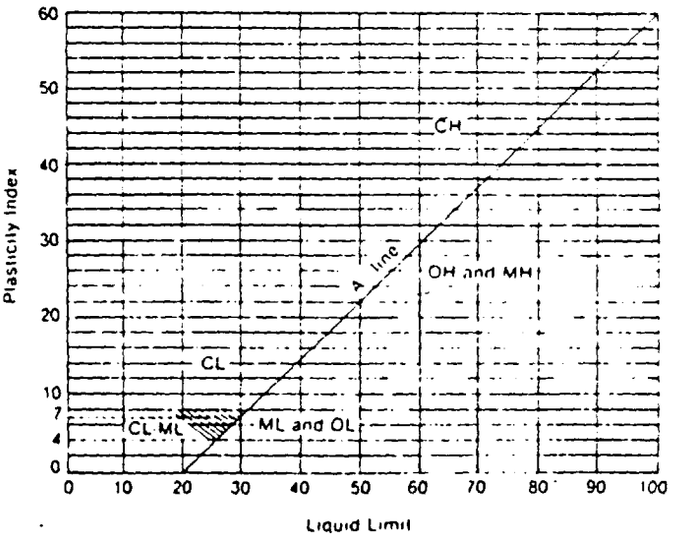
LABORATORY CLASSIFICATION CRITERIA

GW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for SW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 per cent	GW, GP, SW, SP
More than 12 per cent	GM, GC, SM, SC
5 to 12 per cent	Borderline cases requiring dual symbols

PLASTICITY CHART



For classification of fine grained soils and fine fraction of coarse grained soils.

Atterberg Limits plotting in hatched area are borderline classifications requiring use of dual symbols.

Equation of A-line: PI = 0.73 (LL - 20)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Outboard Marine Corporation
Waukegan Harbor Borings
Location: Waukegan, Illinois

Boring No. 1
Surface Elevation
Job No. C 9291
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	qu	W	LL	PL	D
					5	Water to 15'					
					10						
S-1	SS	X	W	0	15	Very Soft, Black Organic Clayey SILT, Trace to Some Sand (OL)					
S-2	SS	X	W	8/6"		Medium Dense, Dark Gray/Brown Silty Fine SAND Trace Clay, Trace Organics, Occasional Fine to Medium Gravel (SM)					
S-3	SS	X	W	12/6"	20						
S-4	SS	X	M	27/6"		*	(2.5-	4.5)	17.9	15.1	
					25	Very Stiff to Hard Gray SILT Some Clay, Trace to Some Fine Sand Trace Gravel (ML)					
					30	End Boring at 30'					
					35	* 6" Fine to Medium Sand, Fine Gravel at 21'6"	( ) Pocket Penetrometer Reading, TSF				
					40						

WATER LEVEL OBSERVATIONS

While Drilling N/A
Upon Completion of Drilling N/A
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 7/2/80 Complete 7/2/80
Crew Chief JVS Rig CME 550
Drilling Method CS 15-30'
4" HW Casing 0-22'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Outboard Marine Corporation
Waukegan Harbor Borings
Location: Waukegan, Illinois

Boring No. 2
Surface Elevation
Job No. C 9291
Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					5	Water to 18'					
					10						
					15						
-1	SS	X	W	0	20	Very Soft, Black Organic Clayey SILT, Trace to Some Sand (OL)					
-2	SS	X	W	16/6"		*					
-3	SS	X	M	48/6"	25	Hard, Gray SILT, Some Clay Trace to Some Sand Trace Gravel (ML)	(4.5+)				
						End Boring at 26'					
					30	* Loose, Brown Fine to Medium SAND, Little to Trace Silt, Occasional Thin Organic Seams (SM)					
					35						
					40						

( ) Pocket Penetrometer Reading, TSF

WATER LEVEL OBSERVATIONS

While Drilling N/A
Upon Completion of Drilling N/A
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 7/2/80 Complete 7/2/80
Crew Chief JVS Rig CME 550
Drilling Method CS 17-26'
4" HW Casing 0-24'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Outboard Marine Corporation, Waukegan Harbor Borings
Location: Waukegan, Illinois

Boring No. 3
Surface Elevation
Job No. C 9291
Sheet 1 of 1

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SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	q_u	W	LL	PL	D
					5	Water to 19'					
					10						
					15						
					20	Very Soft, Black Organic Clayey SILT, Trace to Some Sand (OL)					
S-1	SS	X	W	5							
S-2	SS	X	W	0/6"		*					
					25	Hard, Gray Silty CLAY, Trace to Some Sand (CL)	(4.5)		28.5	16.7	
S-3	SS	X	M	37/6"		End Boring at 25'					
					30	* Loose, Brown Fine to Medium SAND, Little to Trace Silt, Occasional Thin Organic Seams (SM)					
					35		( )	Pocket Penetrometer Reading, TSF			
					40						

WATER LEVEL OBSERVATIONS

While Drilling N/A
Upon Completion of Drilling N/A
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 7/2/80 Complete 7/2/80
Crew Chief JVS Rig CME 550
Drilling Method CS 19-26'
4" HW Casing 0-24'

ARZYN

NEERING INC

LOG OF TEST BORING

Project: Outboard Marine Corporation
Waukegan Harbor Borings
Location: Waukegan, Illinois

Boring No. 4
Surface Elevation
Job No. C 9291
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

AMPLE				VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
ivery	Moisture	N	Depth		Qu	W	LL	PL	D
			5						
			10	Water to 22'					
			15						
			20						
X	W	0		Very Soft, Black Organic Clayey SILT, Trace to Some Sand (OL)					
X	M	38	25	*	(4.0)				
				End Boring at 26'					
			30	* Very Stiff to Hard Gray Silty CLAY, Trace Fine Sand Trace Gravel (CL)	( ) Pocket Penetrometer Reading, TSF				
			35						
			40						

WATER LEVEL OBSERVATIONS

ng N/A
pletion of Drilling N/A
Drilling
Water
ave In

GENERAL NOTES

Start 7/1/80 Complete 7/1/80
Crew Chief JVS Rig CME 550
Drilling Method CS 22-26'

VARZYN
ENGINEERING INC

LOG OF TEST BORING

Project: Outboard Marine Corporation
Waukegan Harbor Borings
Location: Waukegan, Illinois

Boring No. 5
Surface Elevation
Job No. C 9291
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE Type	Recovery	Moisture	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES Qu	W	LL	PL	D
				5	Water to 23'					
				10						
				15						
				20						
S	X	W	0	25	Very Soft, Black Organic Clayey SILT, Trace to Some Sand (OL)					
S		M	72 /6"		Hard, Gray SILT, Some Clay Trace to Some Sand Trace Gravel (ML)	(4.0)				
				30	End Boring at 27'6"					
				35		( ) Pocket Penetrometer Reading, TSF				
				40						

WATER LEVEL OBSERVATIONS

While Drilling N/A
Upon Completion of Drilling N/A
After Drilling
Due to Water
Due to Cave In

GENERAL NOTES

Start 7/1/80 Complete 7/1/80
Crew Chief JVS Rig CME 550
Drilling Method CS 23-27½'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Outboard Marine Corporation
Waukegan Harbor Borings
Location: Waukegan, Illinois

Boring No. 6
Surface Elevation
Job No. C 9291
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery Type	Recovery	Moisture	N	Depth		q_u	W	LL	PL	D
				5	Water to 23'					
				10						
				15						
				20						
					*					
SS	X	M	5/6"	25	**					
SS	X	M	16/6"		***					
					End Boring at 25'6"					
				30	* Very Soft, Black Organic Clayey SILT, Trace to Some Sand (OL)					
				35	** Loose, Brown Fine to Medium SAND, Little to Trace Silt, Occasional Thin Organic Seams (SM)					
					*** Hard, Gray Silty CLAY, Trace to Some Sand Trace Gravel (CL)					
				40						

WATER LEVEL OBSERVATIONS

e Drilling N/A
n Completion of Drilling N/A
After Drilling
h to Water
h to Cave In

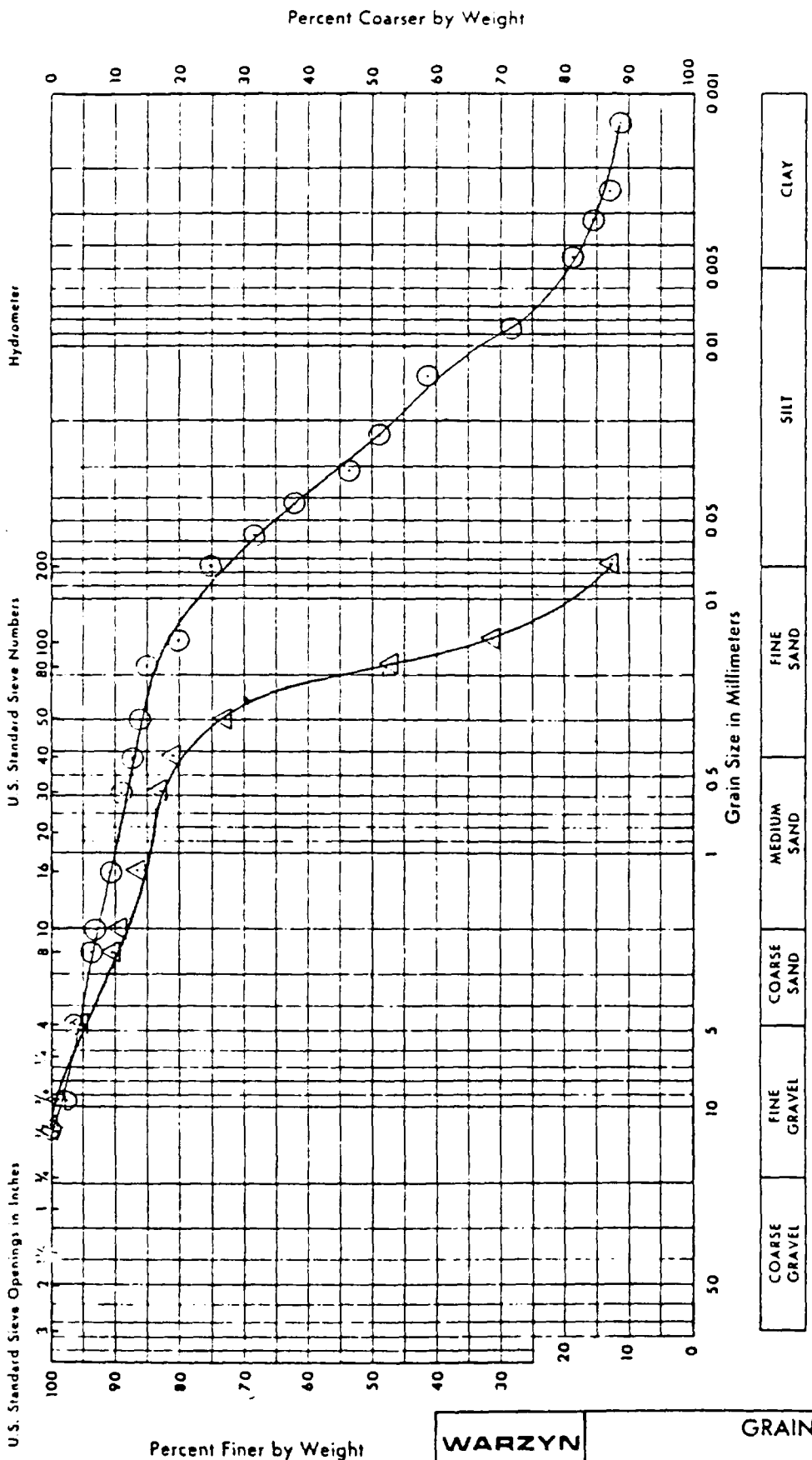
GENERAL NOTES

Start 7/1/80 Complete 7/1/80
Crew Chief JVS Rig CME 550
Drilling Method CS 0-25'½'

APPENDIX D

SOIL TEST RESULTS

WARZYN
ENGINEERING INC



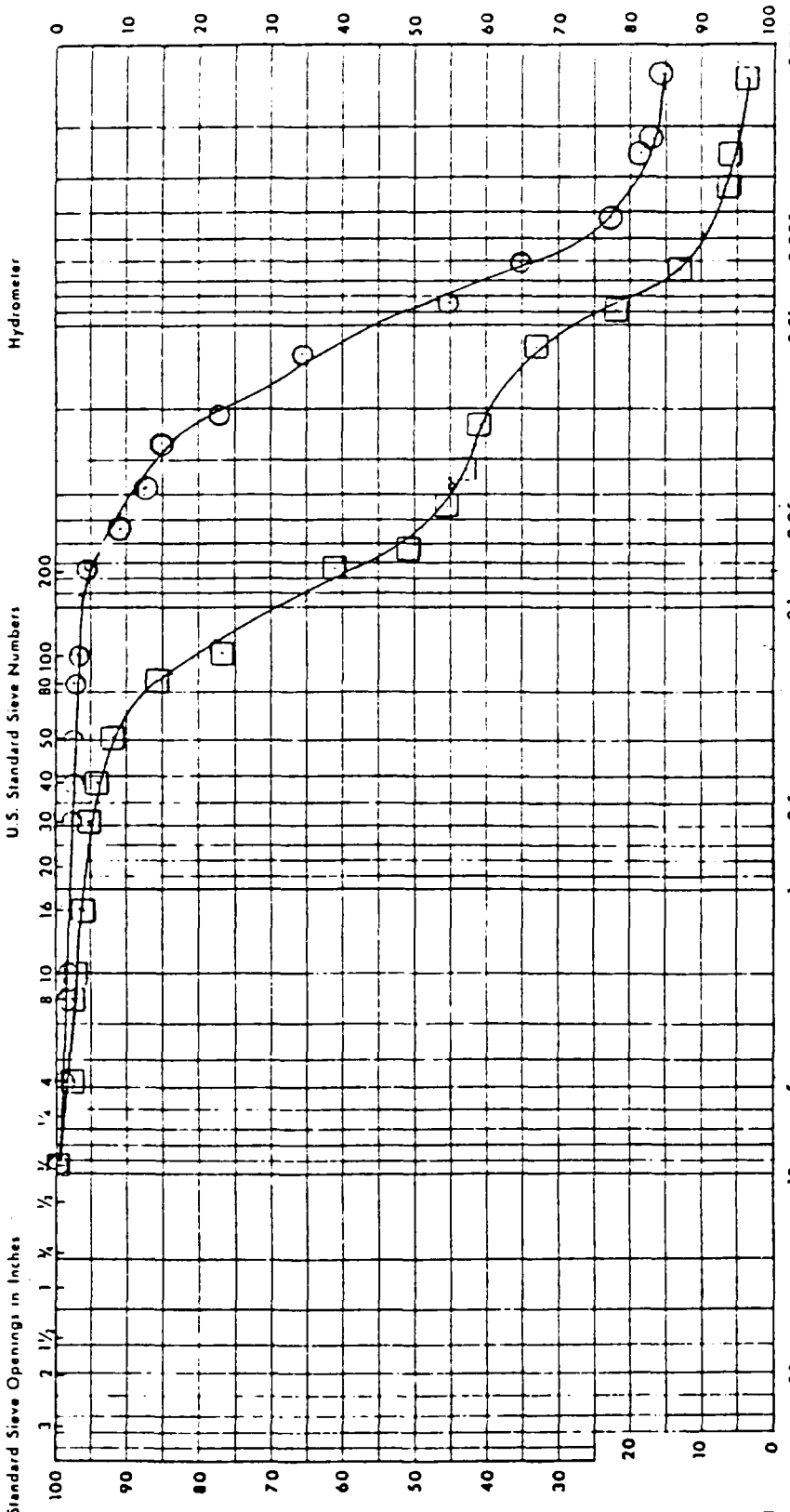
Curve	Sample	Depth	N.M.	L.L.	P.I.	% Grav	% Sand	% Silt	% Clay	Soil Classification
△	B-11	13'				5	82	13		SAND, LITTLE SILT, TRACE GRAVEL
○	B1-4	12'		17.9	2.8	4	22	55	19	CLAYEY SILT, SOME SAND, TRACE GRAVEL (ML)

WARZYN ENGINEERING INC

GRAIN SIZE ANALYSIS

OUTBOARD MARINE CORPORATION
WAUKEGAN HARBOR BORINGS
WAUKEGAN, ILLINOIS

DWN ACC	CHK'D COK	APP'D Daniel R. Vista	DATE 8/5/1980	C-82-11-A1



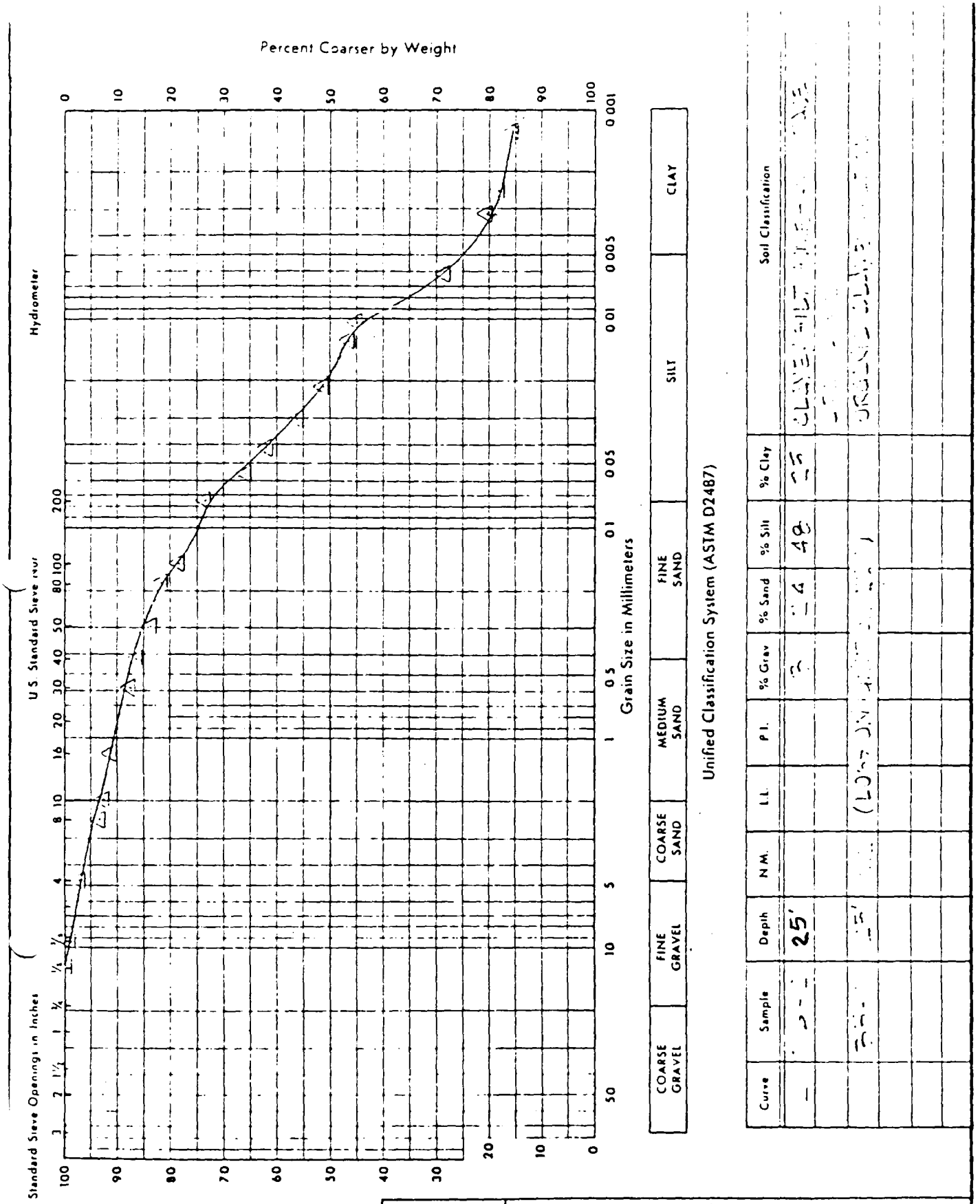
Unified Classification System (ASTM D2487)

Curve	Sample	Depth	N.M.	L.L.	P.I.	% Grav	% Sand	% Silt	% Clay	Soil Classification
○	B2-2	26'				1	4	68	27	CLAYEY SILT, TRACE SAND & GRAVEL
										N.V.
□	B3-1	19'-23'				2	45	44	9	SANDY SILT, LITTLE CLAY TO SOME
										SAND (0-L)
	B3-3			19.5	11.3					SILTY CLAY (CL)

WARZYN ENGINEERING INC

GRAIN SIZE ANALYSIS
OUTBOARD MARINE CORPORATION
WAUKEGAN HARBOR BORINGS
WAUKEGAN, ILLINOIS

DWN	CHK'D	APP'D	DATE
		Daniel R. Visit	8/5/1980

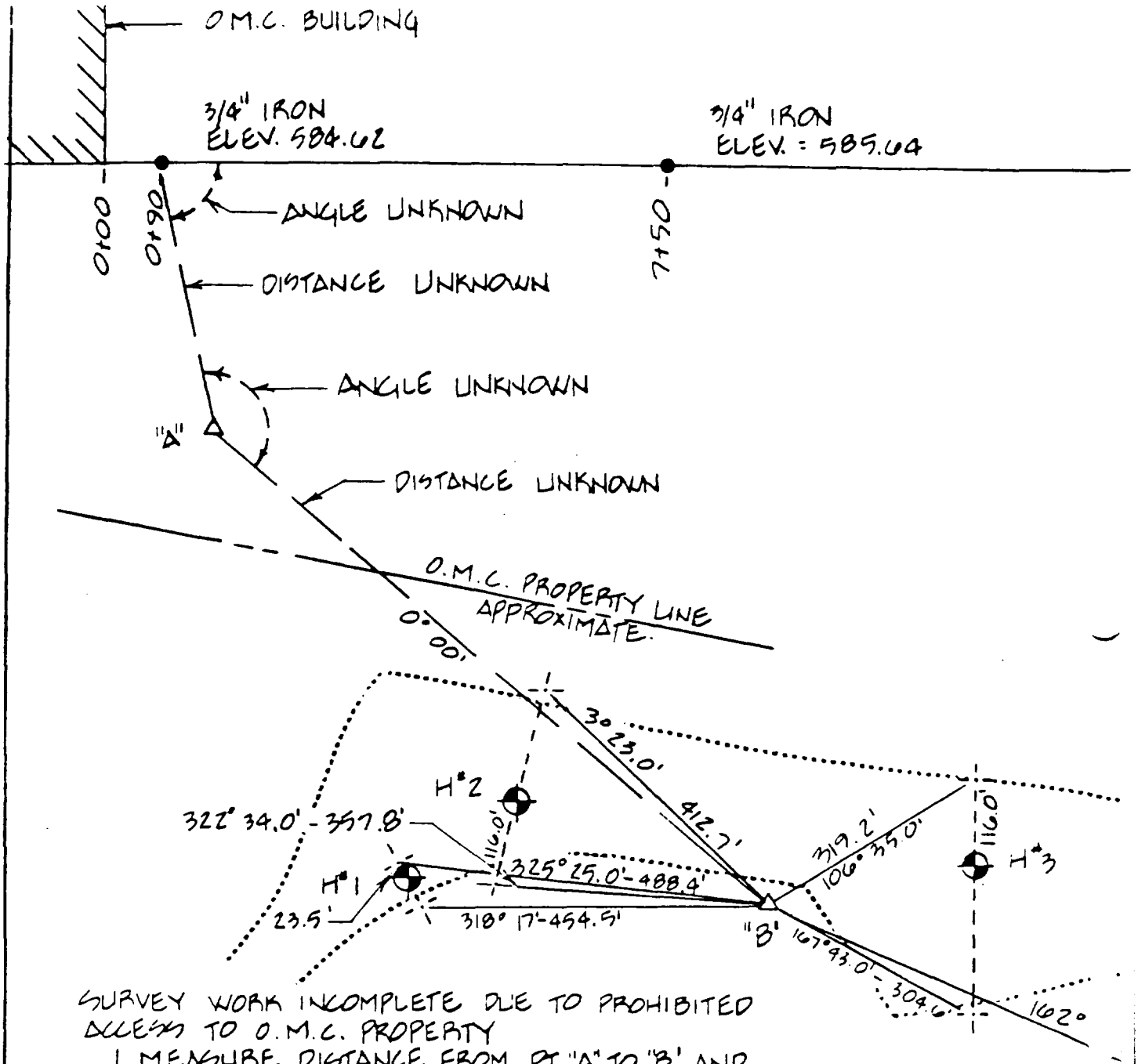


WARZYN ENGINEERING INC

GRAIN SIZE ANALYSIS

OUTBOARD MARINE CORPORATION
WAUKEGAN HARBOR BORINGS
WAUKEGAN, ILLINOIS

DWN	CHK'D	APP'D Daniel R. Vita	DATE 8/5/1980



SURVEY WORK INCOMPLETE DUE TO PROHIBITED ACCESS TO O.M.C. PROPERTY

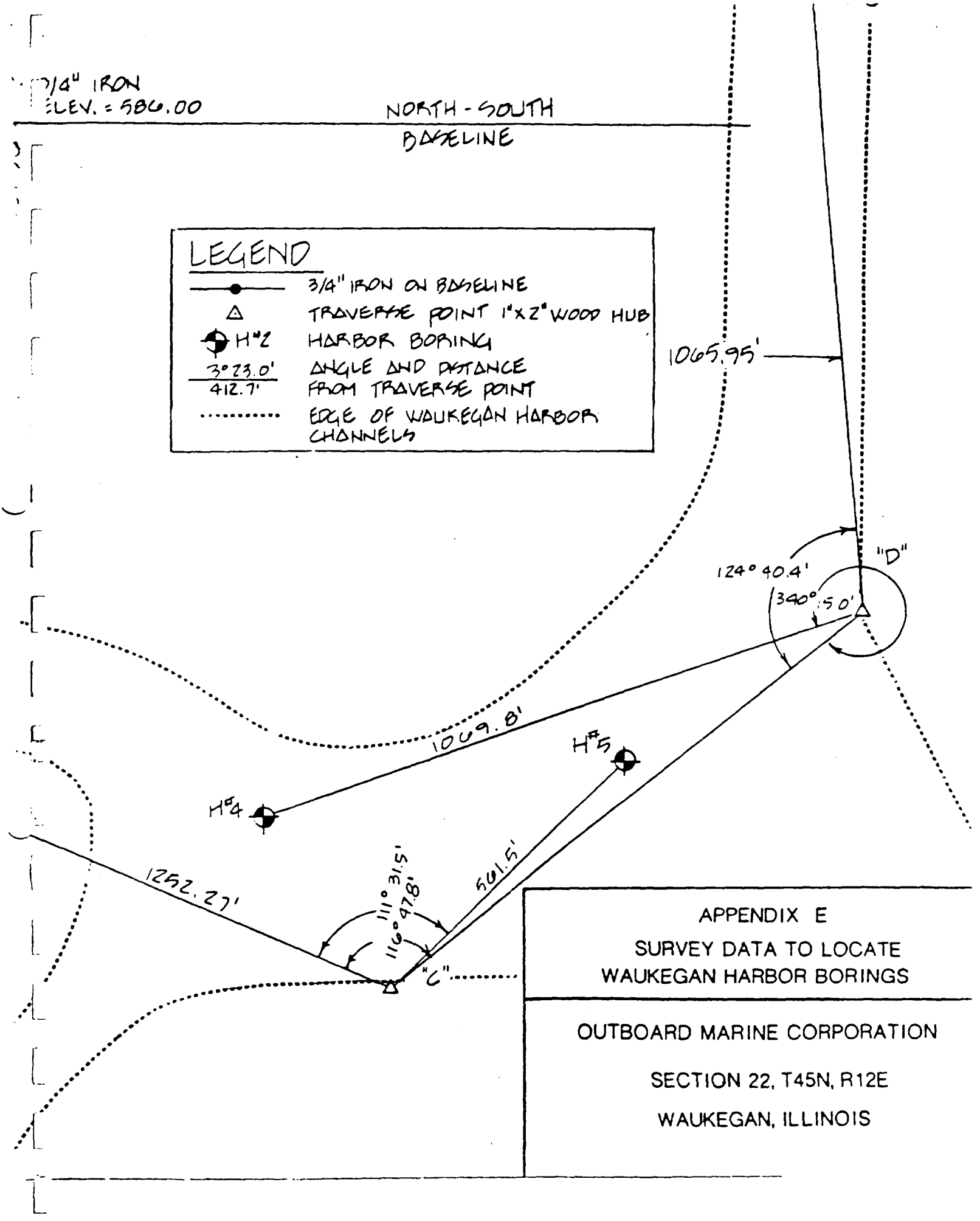
1. MEASURE DISTANCE FROM PT. "A" TO "B" AND FROM PT. "A" TO NORTH-SOUTH BASELINE
2. MEASURE ANGLE AT PT. "A" AND AT NORTH-SOUTH BASELINE.

SCALE 1" = 200'

0 100 200 400

north

WARZYN ENGINEERING INC	DRAWN CMP	SCALE 1" = 200'	SHEET 1 OF 1
	CHECKED SEW	DATE ~~8/1~~ 2/1/80	DRAWING NO. C9291-B1
	APPROVED Samuel E Knoefle		
	REFERENCE C8342, C9177		PRINTED



APPENDIX E

SURVEY DATA TO LOCATE
WAUKEGAN HARBOR BORINGS

OUTBOARD MARINE CORPORATION

SECTION 22, T45N, R12E

WAUKEGAN, ILLINOIS